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MECHANIZE CONSTRUCTION OF CONCRETE, ASPHALT ROADS IN USSR

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SIX-UNIT AGGREGATE BUILDS CONCRETE ROADS

A. I. Legeyda
E. I. Nemirovskiy

In postwar years, construction of concrete roads in the USSR has been mechanized by a group of new machines which work as an aggregate, completing an entire building cycle for successive sections of road.

The D-247 Rail Layer

The road building cycle begins with the advance of the self-propelled D-247 rail-laying device, powered by a 13-horsepower T-62 diesel engine. It lifts the rails and railforms into place, and drives their spikes into the ground.

Specifications of the D-247 are as follows:

Weight (t)	6
Tread (m)	7
Type motor	T-62, diesel
Horsepower	13
Lifting capacity (kg)	500
Lifting height (m)	6.4, 3.7
Lifting span (m)	6

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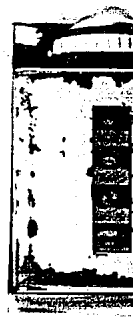


The D-239 Road Foundation Digger

The rail-laying machine is followed by the self-propelled D-239 road foundation digger. This machine removes the ground to the desired depth by means of a large mill, consisting of a drum fitted with blades. The road foundation requires no additional scraping or rolling.

As the machine advances, the earth removed by the milling drum is scooped up onto a scraper conveyer, which carries it off to both sides of the road.

The D-239 moves along the rails on four [two-wheeled] balanced trucks. The two drive trucks, at the rear, have rubber caterpillar tread. Pneumatic jacks connecting the front trucks and the frame permit the frame, with its milling drum, to be raised or lowered a distance of 400 millimeters; this regulates the cutting depth.

Specifications of the D-239 are as follows:

Weight (t)	13
Width, milling cutter (m)	7
Greatest cutting depth (mm)	200
Productivity (cu m/hr)	80
Type motor	D-54 diesel
Horsepower	54

The D-194 Tamper

The D-194 machine, which moves along a single railform on two wheels, is held upright and operated by one worker. It tamps down the ground under the railforms to prevent their settling, and lubricates the sides of the railforms to facilitate their removal after the concrete has been poured.

Specifications of the D-194A are as follows:

Weight (kg)	180
Type motor	K1-B motorcycle motor
Horsepower	2.3
Speed of advance (m/min)	2.66
Frequency of tamping blows per minute	183

After the road foundation has been dug to the desired depth and the rails have been tamped, sand is delivered to the road foundation by trucks and leveled out along it by workers. The area is now prepared for the action of the concrete spreader.

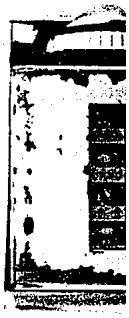
The D-181A and D-181B Spreaders

The concrete spreaders are built in two styles: the D-181A, which has its loading shovel on the side; and the D-181B, with the loading shovel in the middle. In other respects the machines are similar.

A truck delivers the concrete to the loading shovel. This in turn dumps its contents into a hopper, which moves from one side of the spreader to the other, distributing an even strip of concrete across the road foundation. The machine then advances the width of this strip and repeats the cycle. It runs along the railforms on four wheels; drive is transmitted through the rear two.

Specifications shared in common by the D-181A and D-181B are as follows:

Weight (t)	11
Spreading span (m)	7
Width of single transverse concrete strip (mm)	900
Depth of strip (mm)	Up to 400
Hopper volume (cu m)	1.6
Productivity of machine (cu m/hr)	25-35
Type motor	U5-MA
Horsepower	40



The D-182A Finisher

The D-182A concrete finisher follows the spreader, leveling the concrete and smoothing its surface. Essentially, the machine consists of four elements: a vibrating bar, which effects the primary packing down of the concrete; a tamping plate, suspended by springs and operated by an eccentric drive, which further compresses the concrete; a leveling bar, giving the final contour to the road surface; and a smoothing belt, which imparts the final finish to the surface. The machine runs along the railforms on four wheels; drive is transmitted through all four.

Specifications of the D-182A are as follows:

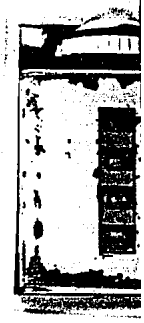
Weight (t)	11
Type motor	U5-MA
Horsepower	40
Type vibrators for vibrator bar	I-7
Number of vibrators	5
Power (kw)	0.4
Generator for vibrators	AP NT-85
Power (kw)	7.2
Finishing width (m)	7
Thickness of paving (mm)	200
Speed of advance, operating (m/min)	1-3.7
Productivity, finishing a strip 200 mm thick, and making two passes (sq m/shift)	1,500-2,000

The D-195B Groove Maker

The D-195B machine rides over the paving surface, transects it and divides it longitudinally with grooves for prevention of buckling during expansion. Basically a girder bridge, the machine is moved by hand along the railforms. The blades which cut the grooves are suspended from the girders, and equipped with vibrators. The vibrator motors receive their power through a cable from the D-182A machine.

Specifications of the D-195B machine are as follows:

Weight (t)	2
Type vibrators used	I-7
Number of vibrators used on transverse blade	3
Number of vibrators used on longitudinal blade	1



Length of transverse grooves (mm)	6,900
Length of longitudinal grooves (mm)	2,100
Depth of grooves (mm)	40-200

The road building cycle is completed with the removal of the railforms by the D-247 machine.

The D-190 Vibrator

When paving over 200 millimeters deep is required, the D-190 vibrator machine is used. It has a frame similar to that of the D-195B. The machine mounts 11 pivoted vibrators, their depth of reach controlled by a hydraulic system. An electric motor provides motive power. This motor is powered from a generator, which also powers the individual electric vibrators. The D-190 is mounted on four wheels.

Specifications of the D-190 are as follows:

Weight (t)	7
Electric motor	MT-11-6
Power (kw)	2.2
Generator	S-82-4
Generator power (kw)	24/30
Generator motor	U5-MA
Horsepower	40
Type vibrators	I-50
Power of vibrator (kw)	0.5
Depth of concrete layer processed (mm)	400
Productivity (sq m/shift)	2,800

The T-138 Trailer

A special trailer, the T-138, carries any of the machines of the group except the light D-195B and D-194A. The trailer rides on five double pneumatic-tired wheels, two in the front and three behind.

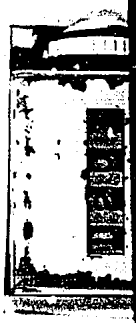
Specifications of the T-138 are as follows:

Weight (kg)	9,400
Length (mm)	14,336
Width (mm)	3,560
Towing unit	S-80 tractor

Production of the Machines; Their Achievements

Series production of the concrete spreader and the finisher was established in 1950; series production of the other machines described above was begun in 1952.

For developing the concrete road building machines, a 1952 Stalin Prize was awarded to the following organizations: the Main Administration for the Production of Road Machines, the Nikolayev Dorwashina Plant, the Leningrad Affiliate of the All-Union Scientific Research Institute of Construction and Road Machine Building, and the Road Scientific Research Institute.



One set of the new road building machines requires from 10 to 12 skilled operators, and from 10 to 15 assisting workers. With this crew, one of the road building sets can build up to 30 kilometers of 7-meter-wide road in a single building season. Were this work performed by hand, it would take about 60,000 man-days of skilled work and 90,000 man-days of assisting work. This would require a total of 1,000 to 1,100 workers. Their work, furthermore, would be quite inferior to that performed by the machinery set.

In the construction of the Khar'kov-Rostov Highway during 1951, a set of the machines laid 420,000 square meters of paving.

New Developments; the D-227 Spreader

Work is now going on toward the further mechanization of road paving, entailing the building of better machines. The D-227 spreader is an outstanding example of this new machinery. Lighter by 3 tons than the D-181A and the D-181B, this machine spreads out the concrete from middle to sides by means of a pair of worm conveyers.

Progress has been made in developing other machines for mechanizing road construction, including one for preparing the railform foundations, and one for spreading and packing down sand as a base for the concrete.

ASPHALT ROADS; THE D-150A SPREADER

S. M. Atoyan

Asphalt is the chief paving material for USSR highways, roads, and squares. In answer to the need for mechanizing its application, mass employment of self-propelled asphalt spreaders was launched in 1950.

The crawler-mounted, self-propelled D-150A asphalt spreader, produced by the Bryansk Road Machinery Plant, receives its supply of asphalt, brought up by a dump truck, in a low hopper at its front. A scraper conveyer feeds the asphalt backward to a transverse worm conveyer, which spreads it out to the sides as it flows down onto the road foundation. A tramping bar, located behind the worm conveyer, packs the asphalt down. Finally, as the machine moves forward, the smoothing plate, situated at the extreme rear of the machine, passes over the asphalt; this bar further compacts the asphalt mass, smooths its surface, and grades it transversely. The smoothing plate acts on the asphalt by its own weight, and by the vibration which the tamping bar imparts to it.

Specifications of the D-150A are as follows:

Type motor	U-5M
Horsepower	40
Productivity (t/hr)	100
Range of the four working speeds (m/min)	1.6-7.5
Width of paving strip (m)	3.03, 3.63

The machine performs satisfactorily under operating conditions, but excessive wear of the crawler sprockets and crawler links has been noted. This is a matter to be remedied by the producing plant.

[Earlier material, describing most of the machines described above, or earlier versions of them, may be found in 00-W-17154 and 00-W-14062.]

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